

Modern Genetics ▪ Skills Lab

Family Puzzle

Problem

A husband and wife want to understand the probability that their children might inherit cystic fibrosis. How can you use the information in the labeled Case Study to predict the probability?

Skills Focus

interpreting data, predicting

Materials

12 index cards

scissors

marker

Procedure

1. Read the Case Study. In your notebook, draw a pedigree that shows all the family members. Use circles to represent the females, and squares to represent the males. Shade in the circles or squares representing the individuals who have cystic fibrosis.
2. You know that cystic fibrosis is controlled by a recessive allele. To help you figure out Joshua and Bella's family pattern, create a set of cards to represent the alleles. Cut each of six index cards into four smaller cards. On 12 of the small cards, write *N* to represent the dominant normal allele. On the other 12 small cards, write *n* for the recessive allele.

| Case Study: Joshua and Bella | |
|---------------------------------|---|
| • | Joshua and Bella have a son named Ian. Ian has been diagnosed with cystic fibrosis. |
| • | Joshua and Bella are both healthy. |
| • | Bella's parents are both healthy. |
| • | Joshua's parents are both healthy. |
| • | Joshua's sister, Sara, has cystic fibrosis. |

3. Begin by using the cards to represent Ian's alleles. Since he has cystic fibrosis, what alleles must he have? Write in this genotype next to the pedigree symbol for Ian.
4. Joshua's sister, Sara, also has cystic fibrosis. What alleles does she have? Write in this genotype next to the pedigree symbol that represents Sara.

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5. Now use the cards to figure out what genotypes Joshua and Bella must have. Write their genotypes next to their symbols in the pedigree.
6. Work with the cards to figure out the genotypes of all other family members. Fill in each person's genotype next to his or her symbol in the pedigree. If more than one genotype is possible, write in both genotypes.

Analyze and Conclude

Write your answers in the spaces provided.

1. **Interpreting Data** What were the genotypes of Joshua's parents? What were the genotypes of Bella's parents?

2. **Predicting** Joshua also has a brother. What is the probability that he has cystic fibrosis? Explain.

3. **Communicating** Imagine that you are a genetic counselor. A couple asks why you need information about many generations of their families to draw conclusions about a hereditary condition. Write an explanation you can give to them.

More to Explore

Review the pedigree that you just studied. What data suggest that the traits are not sex-linked? Explain.
